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BACTERIAL RING ROT OF POTATOES

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Bacterial ring rot[1] is a destructive seed-borne disease of potatoes that has appeared recently in the principal commercial potato-growing areas in the United States and Canada. This disease was probably introduced into North America from Germany, where it has been known since 1908. In the Hastings section of Florida, losses attributed to it were $100,000 in 1937, $20,000 in 1938, and $10,000 in 1939. In 1937, after it was learned that the disease occurred in Florida only in fields planted with affected seed, seed certification agencies of the country were asked to cooperate in controlling the disease. As a result of this request certification officials in Maine and New Brunswick, Canada, immediately agreed to reject for certification all fields in which a trace of bacterial ring rot was found. By 1939 other leading seed-producing states had adopted a zero tolerance for the disease as a prerequisite for certification. Since 1937 the disease has caused little loss in Florida in fields planted with certified seed, and the losses reported for 1938 and 1939 are due almost entirely to planting "selected" seed containing a trace or more of the disease.

Bacterial ring rot is perpetuated in the seed tubers and is spread by the causal bacteria being deposited on the healthy tubers when they come in contact with decayed tubers, equipment used in digging, transporting, and planting the crop, and storage bins in which infected tubers have been stored. The disease is spread also by the seed-cutting knife. When the seed pieces were cut from 25 healthy tubers with a knife contaminated by one smearing with decayed tissue from an infected tuber and planted immediately, the disease developed in 42 out of 100 plants.

Fortunately, the disease is not carried over in the soil from one season to the next in Florida. In the Hastings section the disease has not developed on farms where healthy seed has been planted in fields in which the disease was present the preceding year.

SYMPTOMS

Bacterial ring rot may cause wilting and death of individual branches or all of the potato plant. Some plants may show no symptoms of the disease in their tops but will bear infected tubers. The disease may attack and kill young plants, but it is not usually noticed in the field until the last 30 days of the growing period. The first symptom detected is a wilting of the leaves and branches at their tips. Later a mottling appears in the leaves as the color fades to a pale green, then to a pale yellow. As the leaves die they turn brown and roll upward at their margins. Three to four weeks may elapse after the first signs of wilting are noticed in the plant before the affected parts are killed by the disease. Since bacterial ring rot appears late in the growing season it may be overlooked in fields where the symptoms are obscured by other diseases, particularly late blight or early blight which frequently attack and kill the foliage of potato plants.

Plants with one or more stalks or branches killed by bacterial ring rot usually show signs of the disease in the tubers. When the potato crop is dug diseased hills usually contain tubers varying from those that are apparently sound to those completely decayed. All of the tubers in some diseased hills may show signs of decay but in most of the hills not over one-half of the tubers will be rotted. In the final stages of the disease secondary organisms enter the tuber and a slimy soft rot develops. The bacteria causing the disease enter the tubers through the stolon, and tubers only slightly affected usually show no external symptoms of the disease,

[1]Caused by *Phytomonas sepedonica* (Spieckermann and Kotthoff) Bergey et al.

while severely affected ones may show a cracking of the skin and a reddish-brown discoloration at the stolon end, the eyes, and at other places. The disease may cause a decay of any part or all of the vascular ring and other sections of the tuber. The tissues affected are soft and crumbly and may be gray, cream, yellow, or reddish-brown. In some tubers the cortex and outer storage parenchyma decay and separate from the vascular ring which shows as a rotten ring when the tuber is sliced: hence the name ring rot. The center of an affected tuber may also disintegrate, leaving only a shell.

BACTERIAL RING ROT DIFFERS FROM BROWN ROT

Bacterial ring rot and brown rot[2] are different diseases. The former was discovered in Florida in 1937, while the latter is known to have been present in the state for almost 50 years. These diseases resemble each other in some respects but are caused by different bacterial organisms and can be identified by careful examination of their symptoms. Both may be perpetuated in the seed tubers; but, in Florida, the commercial potato crop is planted with seed grown in Northern states where brown rot does not occur; hence brown rot would not be found in seed potatoes coming from these sources. Brown rot is found only in potatoes grown in soil infested with the causal organism. On the other hand, the organism causing bacterial ring rot does not live from one season to the next in Florida soils and the disease has never been found except in fields planted with infected seed. Both diseases appear near the end of the growing season and cause wilting and death of potato plants. Leaf symptoms of the two diseases differ; brown rot causes wilted leaves to fade to a pale green, after which they die and turn brown; while bacterial ring rot causes mottling in the leaves as their color fades to a pale green, then to a pale yellow, followed by death and browning at the margins as the leaves roll upward.

Brown rot produces a brown to black discoloration of the skin at the stolon end and eyes of the affected tuber, while bacterial ring rot causes a reddish-brown discoloration at these places and often a cracking of the skin of the tuber. Diseased areas in a tuber affected with brown rot are slimy and brown to black, while affected areas in a tuber attacked by bacterial ring rot are soft and crumbly, and gray, cream, yellow, or reddish-brown. Masses of brown rot bacteria are white and sticky and will ooze from freshly-cut vascular bundles of affected stems and tubers; they also often ooze from the stolon end and eyes of tubers where they mix with dirt and, on drying, are glued to the skin. Bacterial ring rot bacteria are also white in mass but are not sticky and do not ooze from any part of an infected plant or tuber.

CONTROL

Planting fields in Florida with seed from potato fields in Maine containing only traces of bacterial ring rot has caused large losses. In 1938 fields planted with such seed showed from 6 to 30 percent of the disease. This seed came from a 10-acre field where only four affected plants were found before the crop was dug. Complete control of the disease is secured only by planting seed that is free of it. Only certified seed potatoes grown in those states where a zero tolerance for the disease is required for certification should be used for planting.

Bacterial ring rot cannot be controlled by the examination of seed tubers while they are being cut. It is possible to eliminate the severely affected tubers at this time but impossible to detect infected ones that show no symptoms. It is difficult to eliminate those with slight disease symptoms, since seed are cut in a hurry, and cutters who might be able to recognize symptoms of the disease have no time to examine individual tubers.

If diseased seed stock is used, some control may be obtained by planting whole seed tubers. Also, if cut seed is allowed to dry soon after it is cut, some spread of the disease will be prevented. However, it would be folly to buy infected seed because it is cheaper than healthy seed and attempt to control the disease by these methods, when all losses can be prevented by planting certified seed that is free of the disease.

If diseased seed are planted the crop will be affected with bacterial ring rot, and it will be impossible to pick out all infected tubers when the potatoes are graded and packed. Many infected tubers which appear to be sound at the loading point will decay in the packages while they are in transit to market and will lower the market value of the whole shipment.

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[2]Also known as Southern bacterial wilt and is caused by *Phytomonas solanaceara* (E. F. S.) Bergey et al.